

## Deciphering how the nanoscale architecture of the actomyosin cortical network determines cell surface tension

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**Research area:** Cell and Developmental Biology and Mathematical Modelling

### Project outline:

Precise control of cell shape is central to a wealth of physiological processes, including tissue morphogenesis, cell migration, and cell division. In animals, cell shape is mostly controlled by the cellular actomyosin cortex, a thin network of actin, myosin motors, and associated proteins found directly underneath the plasma membrane. The cortex generates contractile tension and transmits this tension to the plasma membrane; gradients of tension induce cellular contractions, like those driving cytokinesis or epithelial tissue constriction. While it is clear that cortical contractile forces are generated by myosin motors pulling on actin filaments, the resulting tension cannot be understood without considering the architecture of the actin network itself (Koenderink and Paluch, 2018). Indeed, the cortex is made of thousands of filaments, and the spatial arrangement of these filaments directly affects 1) the number of locations where myosin may bridge the actin filaments and 2) how microscopic forces are transmitted across the system. There is currently no understanding of how the architecture of an actomyosin network determines its tension, and this limits our ability to link molecular perturbations (specific mutations) to the phenotypic scale (cell shape). The aim of this project is to build a realistic mathematical model of the cortex, grounded in state-of-the-art experimental data, to systematically analyze how tension is generated in the network by the activity of molecular motors. The student to be hired will also work on a second topic within the remit of ERC Synergy grant BioMecaNet, from which part of the costs will be claimed.

**BBSRC DTP main strategic theme:** Understanding the rules of life